

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
A National Broadband Plan for Our Future)	GN Docket No. 09-51
)	

COMMENTS OF VIASAT, INC.

ViaSat, Inc. (“ViaSat”) hereby responds to the *Notice of Inquiry* (“*NOI*”) adopted by the Commission on April 8, 2009 in the above-referenced proceeding. The *NOI* seeks comment with respect to a number of issues and is intended to inform the development of a national plan to enable the build-out and utilization of high-speed broadband infrastructure.¹

As a leading provider of communications solutions — including broadband solutions — for both commercial and military applications, ViaSat is pleased to provide its perspective on certain key issues raised in the *NOI*. ViaSat currently provides secure tactical data links to U.S. (and allied) fighter aircraft in challenged environments, as well as satellite broadband to Air Force One and other very important person special air mission (“VIPSAM”) aircraft. ViaSat also has designed, manufactured and shipped more than 500,000 WildBlue satellite user terminals to consumers in the United States and Canada over the past few years. The new ViaSat-1 satellite broadband system, scheduled for launch in early 2011, (i) continues this 23-year legacy of innovation; (ii) represents a fundamental change in the way satellite broadband is currently provided; and (iii) demonstrates the important role that satellite broadband will play in the future of America.

¹ *NOI* ¶ 1.

I. INTRODUCTION AND SUMMARY

ViaSat's approach to satellite broadband differs radically from that of its industry competitors. Existing consumer satellite "broadband" services simply are not adequate. Consumers consider these services to be poor value and subscribe to them as a matter of last resort. The problem with these services is not latency, nor is it entirely speed. Rather, the problem is the lack of sufficient aggregate capacity on current satellites, leading to heavy oversubscription rates (as operators attempt to amortize substantial fixed costs over more subscribers) and inadequate volume caps (as a result of the high cost per delivered megabyte associated with existing satellites).

Today's satellite "broadband" consumers just do not perceive that they are getting good value. There is good reason: Today's satellite service providers have not risen to the challenge of providing a high-enough-quality service offering. We know that other satellite-based services have overcome such problems and in fact are now perceived as the best value by many consumers. Take, for example, satellite TV, which many loyal consumers choose in the face of alternative terrestrial technologies due to their belief that satellite presents the best value — all things considered — and despite the effect of periodic rain outages (which can be minimized through appropriate coding techniques).

ViaSat believes that next-generation satellite broadband, with the right "mix" of speed, provisioned bandwidth, and affordability, should have a central role in a national broadband plan. We also know that these next-generation satellites can play unique roles in mobile broadband, disaster recovery, applications where fiber-like speeds are needed on-demand, and content and entertainment dissemination. Telemedicine, distance learning, and health IT are but a few examples of these applications.

ViaSat has solved the problem with today's satellite "broadband" through its innovative design of ViaSat-1, ViaSat's next-generation platform for satellite broadband services. As an innovator in the satellite industry, ViaSat recognized that a viable satellite broadband solution requires improvements of at least an order of magnitude over existing satellite capabilities. Accordingly, ViaSat already has spent approximately \$120 million in developing the ViaSat-1 system, and expects to spend another \$250-\$275 million on the system prior to launch in 2011. ViaSat-1 will have an aggregate capacity of over 100 Gbps, representing more than a 15-fold improvement over the satellites that are delivering "broadband" today. In fact, ViaSat-1 will have more available capacity than all other commercial spacecraft currently serving the United States, combined.

With these improvements, ViaSat can provide Internet access service with a quality equivalent to the median level of cable modem service today, and at a competitive monthly service rate. ViaSat-1 will be capable of providing approximately 1 million households with Internet access service at downlink speeds of about 4 Mbit/s and uplink speeds of about 1 Mbit/s. Additional spacecraft will expand the capacity of this system. ViaSat's system will support a "provisioned bandwidth" of 30-50 kbit/s per household served² and will be able to grow that rate at 15-20 percent per year, which compares favorably with the range of provisioned bandwidth (30-50 kbit/s) offered across the U.S. by cable systems today. This satellite service will be perceived as better than 80 percent of the DSL services currently available in the United States. The capital cost of the system, including the cost of satellite infrastructure and customer premises equipment, will be less than \$800 per household, regardless of location.

² The importance of "provisioned bandwidth" is discussed in Section III, *infra*.

Although individual users of ViaSat's system normally will be able to access the cable-modem-like quality specified above (ViaSat's middle tier service), ViaSat's technology works by passing each individual terminal with downlink speeds in the hundreds of megabits per second and uplink speeds in the tens of megabits per second. In fact, ViaSat's system can support fiber-like speeds for periods of time, on demand. As a result, ViaSat's system can, among other things, (i) distribute content and local video to all terminals in a region at fiber-like speeds; (ii) support new telemedicine and distance learning applications; (iii) provide the high speed backhaul required for the emergency reconstitution of networks following natural disasters; and (iv) support military and other U.S. Government applications.³

In formulating the national broadband plan, ViaSat therefore urges the Commission to leverage fully the capabilities of next-generation satellite broadband technologies, which, as detailed below, will:

- offer a cost-effective means of providing ubiquitous "last mile" and "middle mile" connectivity;
- serve the ~10-15 percent of American households in areas where deploying fiber infrastructure is cost prohibitive;
- raise the competitive bar in areas currently served by terrestrial broadband; and
- provide a more fulsome broadband solution in as little as the next two years.

ViaSat also urges the Commission to evaluate "broadband capability" in a manner that looks beyond the promised maximum speed of a given system. Rather, such evaluation should focus upon the actual end-user experience, taking into account the impact of system loading during peak usage periods, as well as the impact of the "choke points" in the system

³ Notably, the U.S. Department of Defense has expressed interest in incorporating ViaSat's next-generation satellite broadband technologies into its own fleet. See Peter B. de Selding, *Pentagon Eyeing ViaSat-1 in Wake of T-Sat Cancellation*, SPACE NEWS at 4 (May 18, 2009).

where multiple end users contend for limited bandwidth. To this end, ViaSat recommends that the Commission develop a “provisioned bandwidth” metric to quantify the amount of capacity allocated to each end user of a given broadband network, and as a proxy for expected broadband service quality.⁴

Finally, ViaSat urges the Commission to recognize that the existence of households that are unserved by broadband networks is not a rural phenomenon. Such households exist, and will continue to exist, even within populated or generally well-served geographic areas. This conclusion has been substantiated by studies done in Europe and Australia, as well as by analyses done on current demographics of satellite broadband deployment in the United States. In other words, even where a ZIP code, Census Tract, or similar geographic zone generally appears to have good broadband availability or subscribership, there undoubtedly will be Americans in that very same area who do not have access to broadband service. As such, the Commission should supplement its ongoing geographic mapping efforts (*i.e.*, FCC Form 477 data collection) with additional reporting mechanisms designed to ensure that no American is inadvertently uncounted in the national broadband census. Specifically, ViaSat urges the Commission to adopt appropriate mechanisms to allow the unserved and underserved to self-identify, subject to appropriate confirmation. In this way, the Commission can facilitate the efforts of the Obama Administration to stimulate the provision of true broadband service to the millions of households and businesses across America that remain (and likely will remain) outside the reach of terrestrial broadband systems.

⁴ In the context of the Commission’s proceeding concerning its consultative role in the broadband provisions of the Recovery Act, ViaSat has recommended that a provisioning rate of at least 30 kbit/s to 50 kbit/s be used in NTIA’s and RUS’s definition of broadband — a provisioning rate typical of a median cable modem experience. *See* Comments of ViaSat, Inc., GN Docket No. 09-40 (filed April 13, 2009).

II. SATELLITE BROADBAND TECHNOLOGIES SHOULD BE AN IMPORTANT ELEMENT OF THE NATIONAL BROADBAND PLAN

The American Recovery and Reinvestment Act of 2009 (“Recovery Act”)⁵ tasks the Commission with developing a national broadband plan to facilitate the “access” of all people in the United States to “broadband capability.”⁶ The *NOI* poses a number of questions with respect to how the Commission should define broadband “capability” and “access.”⁷ Regardless of how the Commission resolves these specific questions, ViaSat urges the Commission to ensure that the national broadband plan leverages the capabilities and potential contributions of all broadband technologies. In particular, ViaSat urges the Commission to recognize the unique capabilities that the next generation of communications satellites will bring to bear on the deployment of broadband throughout the United States.

Satellite broadband technologies should play a central role in any national broadband strategy given their unique ability to provide service to unserved or underserved consumers located in rural, ex-urban or hard-to-serve areas of the country. In particular, the next generation of broadband satellites will expand vastly the availability of affordable, high-quality broadband service at speeds and quality levels that are competitive with terrestrial technology. Significantly, satellite broadband systems that will be launched within the next two years will offer users a broadband experience that is similar in terms of speed and price to the broadband service that most Americans currently enjoy. These new networks will more than solve the shortfalls in today’s satellite broadband service offerings.

⁵ American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115 (2009) (“Recovery Act”).

⁶ See *NOI* ¶ 9.

⁷ See *id.* at ¶¶ 15-29.

For example, the ViaSat-1 satellite broadband system is designed to deliver cable-modem-like broadband services at affordable prices. With its ability to serve about 1 million households at a capital cost as low as \$800 each, this system will be a cost-effective means of extending high-quality broadband service to households that simply do not have that option available today. ViaSat-1 will enable any consumer within its service area to receive broadband service simply by installing a small user terminal costing a few hundred dollars.

Thus, it is true, as Acting Chairman Copps acknowledged in his *Rural Broadband Report*, that “satellite broadband, with its near ubiquitous coverage . . . can provide a much-needed connection in rural areas.”⁸ In fact, approximately 10-15 percent of American households are in areas where deploying fiber infrastructure is cost prohibitive, and many of those households are not rural, but actually are near densely populated parts of the country. Thus, satellite broadband is uniquely positioned to serve the millions of households and businesses across America that otherwise would remain outside the reach of terrestrial broadband systems.

However, it also is true that satellite broadband technologies can benefit consumers who simply find the offerings of next-generation satellite broadband providers more attractive than terrestrial alternatives. In fact, for many broadband users, next-generation satellite broadband represents a unique value proposition. Just as competitive market forces caused many consumers to choose cable television over broadcast television, and then satellite television over cable television, ViaSat firmly believes that consumers soon will choose satellite

⁸ Acting Chairman Michael J. Copps, *Bringing Broadband to Rural America: Report on a Rural Broadband Strategy* (May 22, 2009) (“*Rural Broadband Report*”).

broadband because of its overall benefits, and not, as they do today, simply as a matter of last resort.⁹

Next-generation satellite broadband technologies will provide a true broadband experience, while avoiding the need for service providers to install expensive terrestrial infrastructure or recoup high associated installation and operation costs from consumers. Because satellite infrastructure will be shared across large service areas, the marginal costs of serving individual households will be low; as noted above, capital costs will be less than \$800 per household, regardless of location. In contrast, terrestrial broadband solutions typically face high marginal costs stemming from rough topography and low population density — the very reasons that many areas are and will remain unserved or underserved by terrestrial networks.

Next-generation satellite broadband technologies, deployed effectively, also will make a valuable contribution in generally improving broadband availability across the nation. In particular, the availability of higher-quality next-generation satellite broadband service will “raise the bar,” creating competitive pressure and encouraging private investment to improve the quality of terrestrial broadband services. This phenomenon will be similar to the way in which the introduction of satellite-delivered television provided a strong competitive alternative to cable and telco-provided video services, driving those terrestrial providers to improve their services.

In addition to serving end users directly, next-generation satellite broadband technologies will play a significant role as a “middle mile” solution. Many areas — and

⁹ No broadband offering is perfect — even a terrestrial wireless system contains an inherent latency of hundreds of milliseconds. In fact, every broadband offering requires that consumers make tradeoffs as they choose from competing services. The step change that will occur in the quality of next-generation satellite broadband offerings (cable-modem-like quality) will allow consumers to make meaningful competitive comparisons in a manner that they cannot today.

particularly rural areas — lack the dedicated, high-capacity middle-mile lines necessary to connect local service providers to Internet peering points or nodes.¹⁰ Consequently, even where a “last mile” solution is available, the absence of a viable “middle mile” solution can preclude the service provider from offering “robust broadband Internet access to its customers.”¹¹ Next-generation satellite broadband technologies will plug this gap neatly, by providing “middle mile” connectivity that is (i) available in remote areas; (ii) capable of traversing “unfriendly” terrain; and (iii) economically viable even in areas with low population densities.

The benefits of next-generation satellite broadband technologies have been recognized by other countries. Within the next two years, next-generation satellite broadband platforms will be launched not only here in the United States, but also in Europe, where Eutelsat will place a next-generation satellite into service to provide true broadband to up to 2 million subscribers. Moreover, the use of next-generation satellites (together with wireless infrastructure) was expressly identified by the Australian government recently as the most cost-effective way to provide high-speed Internet access service to the last 10 percent of the Australian population that will not be reached by the fiber-to-the-home component of its national broadband initiative, which calls for spending \$43 billion AUS to deploy fiber-to-the-home to reach 90 percent of the population.¹² Similar satellites also are being considered to serve the Middle East, over Latin America, and elsewhere.

¹⁰ *Rural Broadband Report* at ¶ 79 n.175.

¹¹ *Id.*

¹² Joint Media Release, Prime Minister of Australia, Treasurer of Australia, Minister for Finance and Deregulation, Minister for Broadband, Communications and the Digital Economy, New National Broadband Network (Apr. 7, 2009), *available at* http://www.minister.dbcde.gov.au/media/media_releases/2009/022.

For these reasons, the Commission should feature next-generation satellite broadband technologies in the national broadband plan — particularly considering that satellite will play a prominent role in plans to increase broadband access in so many other parts of the world.

III. THE COMMISSION SHOULD DEFINE “BROADBAND CAPABILITY” IN A MANNER THAT ACCOUNTS FOR EXPECTED THROUGHPUT DURING PEAK USAGE PERIODS

The *NOI* seeks comment on how the Commission should define the term “broadband capability.”¹³ Regardless of the exact definition adopted, it is critical that the Commission account for more than minimum network speed in defining broadband capability. Indeed, network speed is not even the most relevant factor in defining quality of service for an end user. The *NOI* suggests as much in seeking comment on whether the definition of “broadband capability” should account for an “experiential” metric based on a consumer’s ability to access sufficiently robust data for certain identifiable broadband services.¹⁴

An even more important factor influencing the consumer broadband experience is the amount of congestion on the network during peak traffic times and how that congestion will influence the actual speeds experienced by the user. Anyone who has ever driven a “fast” car on a highway in bumper-to-bumper traffic can appreciate this point. Congestion can ruin the broadband experience, just as it can ruin the driving experience.

“Provisioned bandwidth” — the minimum amount of total bandwidth allocated per subscriber across the network — is an effective mechanism for measuring the potential for congestion in a broadband network, and thus predicting the likely user experience. The level of provisioned bandwidth determines how congestion during peak traffic times affects the actual

¹³ *NOI* ¶ 15.

¹⁴ *Id.* at ¶ 17.

throughput levels enjoyed by the user, and the extent to which consumers will experience congestion, slow downloads, sluggish page load times and unacceptable performance. Provisioned bandwidth also influences whether service providers actually are able to provide service at advertised network speeds.

Any broadband delivery platform with insufficient provisioned bandwidth per subscriber will perform poorly. All networks, regardless of technology (*e.g.*, wireline, terrestrial wireless, cable, satellite), have “choke points” where bandwidth is aggregated and shared among multiple end users, and where congestion can result in significantly slower service for end users (*see* Figure 1, below). Nevertheless, properly designed and managed networks can minimize the impact of these choke points by provisioning appropriate amounts of bandwidth on a per subscriber basis.

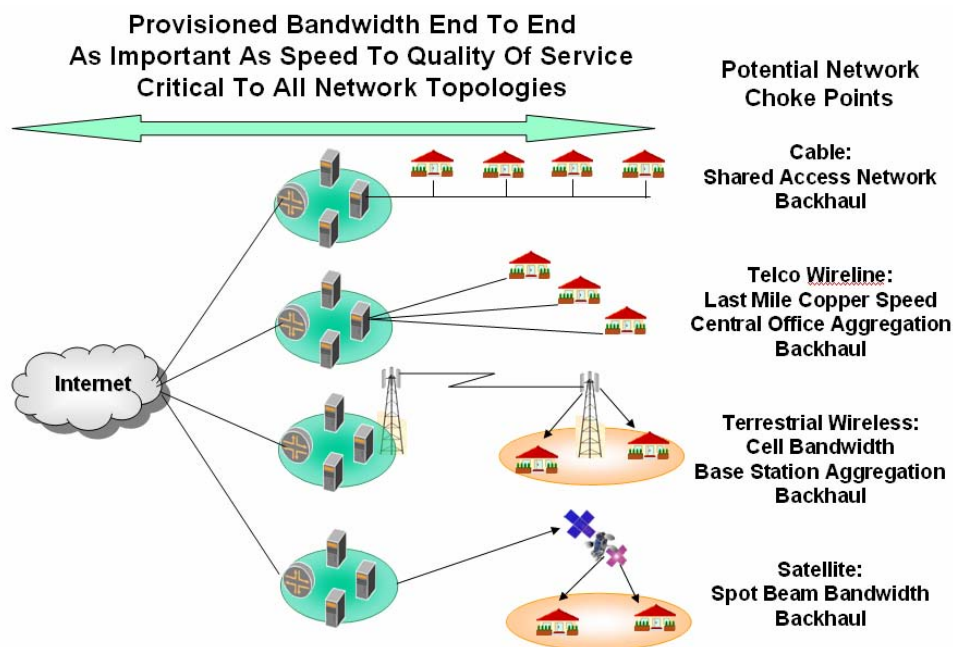


Figure 1

The level of bandwidth provisioned by a service provider can be derived empirically and represents a balance between: (i) subscriber traffic demands and the desire to

receive advertised speeds 100 percent of the time; and (ii) the service provider's need to deliver an acceptable quality of service in the most economical fashion. The provisioning rate for any system can be readily calculated by dividing the total bandwidth available at the relevant choke point by the total number of subscribers that are assigned to share that bandwidth (*i.e.*, the worst case situation where all subscribers contend for access simultaneously). To illustrate:

- Assume that a cable access network is designed to share 10 Mbit/s among a maximum of 200 subscribers. If at busy hour, 100 active users contend for access to the network, each will get an average 100 kbit/s (10 Mbit/s/100) of allocated bandwidth. This allocated amount would be more than enough, given the bursty nature of data transmissions, for each to have a high quality of service.¹⁵ If the maximum number of subscribers assigned to this node on the cable system is 200, then the "provisioned bandwidth" on this system would be 50 kbit/s (10 Mbit/s/200 total subscribers assigned to this network).
- Assume that a 3G wireless cell has a combined bandwidth of 20 Mbit/s. The maximum speed achievable by an individual subscriber at the edge of this cell might be 1.5 Mbit/s. Suppose further that the wireless service provider has 2,000 subscribers in that cell. The provisioned bandwidth would only be 10 kbit/s per subscriber (20 Mbit/s/2,000 subscribers). Even though an individual subscriber could expect to get 1.5 Mbit/s during periods of little congestion, that same subscriber would see greatly reduced speeds at peak hour because the 10 kbit/s of provisioned bandwidth is well below the empirically derived amount of 40-50 kbit/s necessary to deliver a high quality of service in today's Internet. The service provider would have to shrink the cell size to cover only 400 subscribers, or quadruple the bandwidth in the cell, to provision sufficient bandwidth (50 kbit/s) for an acceptable quality service.
- Assume that the same 3G wireless cell described above, having a combined bandwidth of 20 Mbit/s, was supporting a total of 400 subscribers and thus, the allocated bandwidth per subscriber was 50 kbit/s over the access cell portion of the network. Assume further, however, that because the cell is located in a remote area, the network uses satellite backhaul from that base station, and that satellite link provides only 4 Mbit/s of backhaul capacity. In this case, the choke point would be the satellite backhaul, where the provisioned bandwidth would be 10 kbit/s per subscriber (4 Mbit/s of backhaul/400 total subscribers). The quality of service in this example would suffer, not because of the use of satellite backhaul, but because only 10 kbit/s

¹⁵ Because most Internet traffic consists of data packets that are sent intermittently, the chances are low that all users on the network are sending or receiving data simultaneously.

of bandwidth was allocated to each subscriber over that portion of the network. In order to provide service of acceptable quality using this network architecture, the bandwidth of the satellite backhaul would need to be increased to 20 Mbit/s.

As noted above, today's cable broadband systems typically support provisioned bandwidths of between 30 and 50 kbit/s per household — which is sufficient in most cases to support true broadband service. On the other hand, existing satellite broadband systems support provisioned bandwidths of between 5 kbit/s and 10 kbit/s. These inadequate provisioning rates have resulted in customer dissatisfaction, high churn, and a view of satellite broadband as a solution of last resort. Of course, current operators could provision their services at cable-like quality levels, but their retail subscriber charges would increase substantially as a result.

In contrast, next-generation satellite broadband providers will be able to provide cable-like quality levels at reasonable costs. For example, ViaSat's system will be able to support provisioned bandwidths of between 30 and 50 kbit/s per subscriber. Moreover, ViaSat will be able to increase these provisioned bandwidth levels at a rate of 15-20 percent per year. As a result, ViaSat's system — and similar next-generation systems — will make satellite broadband truly competitive.

ViaSat is not suggesting that the Commission limit a service provider's flexibility in identifying an appropriate level of provisioned bandwidth for any given service offering. Rather, ViaSat simply is suggesting that the Commission should require broadband providers to identify the amount of provisioned bandwidth per user, so that the Commission can take the likelihood of network congestion into account when defining "broadband capability" and formulating policies designed to increase access to meaningful broadband services.

IV. THE COMMISSION'S DATA MAPPING EFFORTS SHOULD COUNT EVERY AMERICAN WHO DOES NOT HAVE ACCESS TO BROADBAND SERVICES

In the *NOI*, the Commission correctly identifies the need for “up-to-date and complete information on existing broadband deployment” in order to formulate a national broadband plan.¹⁶ The Commission also notes that the Recovery Act directs the Commission to evaluate, in the national broadband plan, the “status of deployment of broadband service,” including the status of projects supported by Recovery Act grants.¹⁷ Accordingly, the *NOI* notes that FCC Form 477 was recently revised to collect broadband subscribership data at the Census Tract level, and seeks comment as to how the form might be further improved.¹⁸

While FCC Form 477 data provides a useful tool in evaluating aggregate levels of broadband subscribership, the Commission should recognize that the form is an imperfect tool for measuring broadband availability in localized areas. Even Census Tract-level data lacks sufficient granularity to assess such availability, which may vary from block to block, street to street, or even household to household. Because Census Tracts are defined to include between 2,500 and 8,000 persons, the spatial sizes of Census Tracts vary widely depending on population density.¹⁹ Thus, in rural areas, Census Tracts can be quite large. Even in populated areas, though, Census Tracts can contain thousands of households, with varying levels of access to broadband communications infrastructure.

At bottom, any attempt to identify unserved and underserved households based on geographic reporting (whether ZIP codes, Census Tracts, or other) inevitably will fail to account

¹⁶ *NOI* ¶ 29.

¹⁷ *Id.* at ¶ 61.

¹⁸ *Id.*

¹⁹ See U.S. Census Bureau, *Census Tracts and Block Numbering Areas*, at http://www.census.gov/geo/www/cen_tract.html (Apr. 19, 2000).

for some households — a problem confirmed by the actual experience over the past several years of the Australian government with its Australian Broadband Guarantee program. Simply put, there are pockets of unserved and underserved households throughout America, even in and around areas that are considered to be densely populated, and for which service providers would be expected to report high levels of broadband subscribership on FCC Form 477.

This phenomenon is confirmed by the fact that most of the approximately 1 million satellite-based broadband subscribers in North America today are located in and around the more populated portions of America — areas east of the Mississippi and on the West Coast. Even in rural areas, most satellite broadband consumers are located in areas considered to be relatively well-served. For example, most satellite broadband customers in Kentucky are located in areas where Connect Kentucky (a public/private partnership renowned for its broadband mapping efforts) indicates that broadband is offered by more than one terrestrial service provider. Given the limitations of existing satellite broadband offerings, it is unlikely that these customers have access to terrestrial broadband solutions. Yet, traditional mapping fails to identify these consumers as unserved by terrestrial broadband providers. It is reasonable to assume that many other households in areas presumed to be well-served are incapable of accessing any broadband service.

Any mapping methodology that fails to recognize that individual households in relatively populated or well-served geographic regions can be unserved or underserved is inherently flawed, and necessarily would understate the number of unserved households in America. In order to correct these deficiencies, ViaSat urges the Commission to supplement the current broadband mapping processes with a mechanism that accounts for all unserved and underserved consumers. Specifically, the Commission should supplement current broadband

mapping efforts — as embodied in FCC Form 477 — with mechanisms that allow individual households to self-identify as unserved or underserved. Such mechanisms would be similar to those implemented by the Australian government as part of its Australian Broadband Guarantee program, by which consumers can have themselves counted. In addition, broadband providers and other interested parties should be permitted to demonstrate, through technical or empirical studies, that portions of a given geographic region are unserved or underserved.

V. CONCLUSION

The development and implementation of a national broadband plan is critical both to stimulate the economy and achieve longer-term policy goals. In formulating that plan, the Commission should ensure that the capabilities of next-generation satellite broadband technologies are leveraged fully. Moreover, the Commission should ensure that it defines “broadband capability” in a manner that reflects “provisioned bandwidth” metrics, and maps access to broadband capability in a manner that accounts for granular differences in the availability of broadband services within populated geographic areas as well as those areas that are presumed to be well-served.

Respectfully submitted,

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